Feasibility Study
For Arcademia

IA Senekal 41218787

M Kruger 40919897

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Quality Manager *[if applicable]*			
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Project Office Manager *[if applicable]*			

Table of content

1. Executive Summary

Children must become digitally literate and learn to code at a young age due to the rapid advancement of technology. Traditional teaching approaches frequently fail to engage with kids successfully, resulting in poor memory of key STEM concepts (Thomas and Tian, 2021). To remedy this issue, Academia recommends creating an innovative device that will include games that include teaching coding and other digital skills, increasing retention and participation in STEM education (Gaulddal, 2020). Academia will provide a useful product and thorough service by supplying this technology to schools and teaching instructors on how to utilize it. If effective, the arcade box might help young kids develop important problem solving and critical thinking abilities, which are key for promoting interest in STEM subjects (Adeyeye, Ashaolu and Idowu-Adebayo, 2022). This might result in an inflow of students studying Science, Technology, Engineering and Mathematics (STEM) which would help institutions through enrollment and income.

The goal is to assess potential options for improving digital learning through gaming in order to make coding instruction more interesting and accessible to young learners. Several solutions were assessed on important criteria such as technological capacity, cost-effectiveness, involvement level, and scalability. The Proposed solutions include building a portable arcade box, providing an online learning platform, and constructing a robotics kit. The study found that the Portable Arcade Box is the most practical option, providing immersive and hands-on learning experiences powered by Raspberry Pi. This allows kids to participate in coding in a gamified environment (Ashbourn, 2014). The practicality was evaluated based on engagement accessibility, and technological execution, and the Portable Arcade Box emerged as the best solution for the business challenge.

To efficiently execute this solution, academia will use a disciplined approach that includes Agile techniques and prototyping. The project will be separated into four phases: planning, execution, testing, and implementation. During the planning phase, the team will work with stakeholders to create a thorough project plan that includes all relevant components. The execution phase will be iterative, with weekly sprints providing ongoing feedback and change. Testing will assure product quality, including user participation to confirm the effectiveness of learning experience. Finally, the implementation phase will focus on distributing the arcade box in schools and educating educators to ensure optimal utilization (Gulddal,2020).

2. Problem Statement

2.1 Business Environment

The demand for engaging educational tools arises from several factors in the current business environment. First, there is a growing emphasis on using new approaches to teach young kids coding and digital skills. As technology becomes more prevalent in everyday life, educational institutions understand the value of early digital literacy. According to research, interactive learning environments dramatically improve young learners' problem-solving and creative abilities, which are critical for academic and professional success.

Secondly, many schools have major resource limits. A large number of educational institutions lack the necessary infrastructure and funds to undertake comprehensive coding programs. This constraint opens the door to more economical and engaging instructional tools that can be readily integrated into existing curriculum.

Internally, educational departments struggle to properly monitor and support student participation. While there are existing tools and data on student activity and performance, they are frequently scattered and underused. For example, schools may have access to a variety of educational platforms but lack the ability to link these resources to deliver a consistent learning experience. The proposed solution should assist in bridging this gap by providing a uniform platform that stimulates engagement and feedback, thereby improving the educational experience.

External Factors Influencing Educational Context:

1.**Political Support**: Government efforts are increasingly emphasizing the necessity of developing digital skills in early learners. Funding sources for creative educational goods are becoming increasingly available, perhaps easing the adoption of the solution in schools.

2**.Economic Pressure**: As educational institutions confront economic constraints, there is an increased need for solutions that boost efficiency and student retention. The solution should not only offer an entertaining way to learn coding, but it also hopes to lower dropout rates by making learning more fun.

3.**Social Awareness**: Students are more aware of the importance of their mental health and well-being. The solution fosters a supportive learning atmosphere that stimulates cooperation and creativity, meeting the demand for engaging and dynamic educational experiences.

4.**Technological Readiness**: Advances in technology, such as cloud computing and mobile apps, make it possible to design and implement the solution successfully. Schools are more prepared to include such technologies into their instructional methods.

5**.Legal Considerations**: Compliance with data protection laws, such as the Protection of Personal Information ACT(POPIA), is critical. The design will stress ethical data management, perhaps increasing its attractiveness to privacy-conscious institutions.

2.2 Business Problem

The primary business issue is a lack of cost-effective and engaging digital literacy solutions for young learners. Currently, teaching coding and digital skills to young kids requires limited resources, with many existing solutions being too expensive or not targeted to individuals' unique requirements.

The main reason for this problem is a dependence on traditional teaching techniques that do not embrace interactive and enjoyable learning opportunities. Many educational institutions lack creative and cost-effective methods for teaching kids coding and digital skills. This resource gap limits students' exposure to critical concepts and abilities, making them unprepared for future academic and employment prospects.

This dilemma has far reaching consequences. Without access to compelling digital literacy tools, children's interest in STEM topics may wane, resulting in fewer children perusing these essential areas in higher education. This impacts not just individual people, but also the educational system and the economy, as a lack of digital skills can impede talent development.

Immediate action is required; each school year without these tools is a missed opportunity for younger learners to master critical skills. Delays in addressing this issue may leave a generation of kids unprepared for the demand of the digital economy.

To develop a solution that effectively addresses this problem, it is essential to consider the following contributing factors:

- **Engagement:** Children frequently struggle to focus during traditional lessons. The solution will give an engaging platform that holds their attention while teaching coding skills through gameplay.
- **Accessibility:** Many present options are unaffordable for schools and families. The product seeks to be affordable, allowing more people to access digital learning.
- **Social Interaction:** High academic demands may restrict children's ability to cooperate and learn together. The game can promote social connections among classmates, hence improving the learning experience.
- **Skill Development:** Through exciting challenges and riddles the game helps kids develop critical thinking and problem-solving skills in addition to coding skills.
- **Support Structures:** While some schools provide assistance, delay in obtaining resources can disrupt learning. The project will give rapid feedback and encouragement, assisting kids on their learning adventures.

The opportunity is to create a product that has a unique instructional tool that overcomes the digital education divide. This approach, which incorporates coding skills into entertaining games, can spark early interest in STEM subjects among kids.

2.3 Business Opportunities

The current task provides a substantial commercial opportunity: The creation and implantation of an engaging educational tool for teaching digital literacy and coding skills to young kids. This game will give an interactive platform that will not only grab children's curiosity, but will also be a fun and effective approach to teach them important skills.

The solution will incorporate a variety of learning modules centered on coding, problem solving and critical thinking through gameplay. This system will allow young learners to advance at their own speed, receive rapid feedback, and participate in collaborative learning activities. The game can also include stages and achievements that measure individual progress, encouraging people to keep studying.

This opportunity directly supports educational institutions' aim of improving STEM education and preparing students for the digital economy. By producing a new product today, we can establish ourselves as pioneers in creative educational technologies that make digital learning accessible and pleasurable.

Positive impact of realizing the opportunity

- Increase Children Engagement
- Enhanced Learning Outcomes
- Broader Accessibility
- Strengthened Institutional Reputation
- Data-Driven Insight

In conclusion, establishing a solution not only fills a vital gap in digital education, but also creates potential for strategic leadership and innovation in the educational environment. By taking action now, we can develop a revolutionary tool that prepares young for future success in an increasingly digital environment

3. Requirements Statement

3.1 Business Drivers

1. Student Engagement & Learning Outcomes: To ensure higher rates and practical application skills there is an urgent need for improvement in how coding is taught.
2. Technological Advancement in Education: For modern education there is a need for hands-on learning tools and integrating interactive tools with rapid technological evolution.
3. Market Demand for STEM Education: There is an increase in the necessity for engaging educational solutions through growing emphasis on science, technology, engineering, and mathematics(STEM)learning.
4. Competitive Advantage: The use of gamified learning technologies propels educational institutions to the forefront of new teaching approaches.
5. Scalability & Cost Efficiency:The product can be expanded for wide implementation and with low cost

6. Timely Implementation for Academic Integration:To fit with academic curriculum and forthcoming school years, the solution must be implemented within a specific time frame

3.2 Business Requirements

Business Problems (threats) and Opportunities	IT Solution Requirements
Limited access to digital literacy tools There is a substantial gap in availability to engage digital literacy tools for young children.	Create an interactive coding game, making learning accessible and exciting for all students (Guldal,2020).
High cost of existing educational kits. Many existing teaching kits are extremely costly, which limits their use in schools	Keep expenses down by using low-cost technology, such as a Raspberry Pi, to develop an economical yet usable instructional tool. This method is required to guarantee that educational resources are available to a large audience (Ashborn 2014)
Lack of engaging and interactive learning tools Students frequently find traditional learning techniques unengaging, resulting in diminished interest in STEM disciplines.	Create an interactive drag-and-drop game interface with a feedback system, enhance student engagement and motivation (Thomas and Tian, 2021).
Durability of digital tools especially in a school environment Many digital instruments cannot endure the demands of a school environment, necessitating periodic replacement.	Use of durable materials such as wood for the frame of the arcade box, to provide durability and robustness in schools (Adeyeye, Ashaolu and Idowu-Adebayo, 2022).
Scalability of digital tools The capacity to readily reproduce successful solutions can increase educational access in several areas.	Design the product to be simple to copy, allowing schools to produce their own units swiftly and affordably (Moise et al., 2020).
Offline Functionality Many schools, particularly in rural regions, lack consistent internet connectivity, which impedes learning.	Ensure that the product can run without internet access. Especially if need arrives to implement in rural schools (Guldal, 2020)

4. Feasibility Assessment

4.1 Potential Solutions

Potential Solutions	Brief Description
Solution 1: Portable Arcade Box	A small, inexpensive gaming device meant to teach coding through interactive games.
Solution 2: Online Learning Platform	A web-based platform that provides coding lessons with gamified components and assessments
Solution 3: Robotic Kits	A kit containing different electronic components which kids can assemble to create a robot. This teaches coding, electronics and engineering skills.

Solution 1: Portable Arcade Box

Description

The first option would be to design and build a portable arcade box that can be used without the need of internet connection. It will be easily portable due to its smaller size compared to traditional arcades. No other component will be needed to teach digital literacy skills such as a keyboard and mouse since all functionality will be in one single box. Users of the arcade box have access to a game which allows them to drag-and-drop coding blocks onto a screen. The game will have feedback system guiding the user through what to do next to achieve desired results

Benefits

Benefit Category	Benefit Description	Benefit Value
Business problem	The main problem identified is the lack of digital education tools to gain interest into stem fields. This solution provides and interactive interface through gaming to support retention and interest	5
Opportunity	This solution will create interest in digital fields which in turn will generate more interest to Universities providing degrees in STEM fields	5

Engagement	The solution focuses on the gamification of education which is of great interest to children. Children love learning through games therefor engagement in digital literacy will be high	5
Accessibility	The box will be small in size and easy to move around therefore it is extremely mobile and easy to access demanding on traveling cost.	3
Technological Execution	The box uses Raspberry Pi which is easy to use and functionality changes are easy to do.Software installed will have to be compatible but using this component mostly has high advantages	4

Costs

Expense Category	Expense Description	Expense Value	Expense Type
Cost of human resources	The cost involved paying developers and project managers to develop the portable arcade box.	570000	Indirect cost
Cost of travelling	The cost involved traveling to schools including accommodation	20865	Direct cost
Equipment	The cost of buying and assembling the arcade box.	6277	Fixed Cost
Software Cost	The cost of developing the software for the project	1500	Fixed Cost
Other expenses	Contingency fee added in case of emergencies	2993	Indirect cost

Feasibility

Feasibility Rating	Assessment Method
4	**Budget**: It is not the most cost effective since all components have to be built from scratch. Components are within budget and cost are minimized as much as possible

5	**Scope**: The system meets the clients expectations and provides innovative solutions. The solution is of personal interest to the sponsor of the project.
4	**Schedule**:Special care will have to be given to the schedule to ensure building and implementation does not run behind schedule

Risks

Risk Description	Risk Likelihood	Risk Impact	Risk Mitigating Actions
Budget	Low	High	All components need to be built from scratch if not done correctly it could result in waste of resources which increase costs. Therefor developers have to make time for training
Schedule	Medium	High	System has never been built before therefore there is a possibility of going over schedule. To mitigate, enough time has to be spent on project management.
Development	Medium	Medium	Enough time has to be spent on the design of the arcade box and various testing should be done before put into use
Maintenance	Low	Medium	Durable material should be used when developing the box

Issues

Issue Description	Issue Priority	Action Required to Resolve Issue
Limited development skills	High	Developers do not have training on how to build an arcade box and since it is such a niche project it does not have set instructions on how to construct. Therefore developers will have to make time to train in the necessary skills to develop the project.

Resources waste	Medium	Developers will have to have resources to test with to ensure vital components are not broken during the development phase
Digital Competence of Teachers	Low	Functionality training should be provided to teachers to ensure they understand how the arcade box can be utilised.

Solution 2: Online Learning Platform

Description

The following solution focuses on developing a web-based platform to teach digital literacy skills to children. The platform will provide coding lessons with an interactive game based approach. Assessments will be in the form of coding puzzles or games that the children will have to complete based on what they have learned in passed lessons on the platform. Children will have to have internet access to be able to use the platform and they would also require a computer. The device used needs to have certain hardware such as a keyboard and mouse.

Benefits

Benefit Category	Benefit Description	Benefit Value
Business problem	The main problem identified is the lack of digital education tools to gain interest into stem fields. This solution provides an interactive interface through gaming to support retention and interest.	5
Opportunity	This solution will create interest in digital fields which in turn will generate more interest to Universities providing degrees in STEM fields	5
Engagement	The solution focuses on the gamification of education which is of great interest to children. Since they can use the platform on their own time however they might not constantly engage with the platform.	3

Accessibility	The platform requires access to the internet. This could be a problem for some institutions and children especially in rural areas	2
Technological Execution	The solution requires children to have their own devices however the software will be freely available to them.	3

Costs

Expense Category	Expense Description	Expense Value	Expense Type
Cost of human resources	The cost involved paying developers and project managers to develop the system	530000	Indirect cost
Software Cost	The cost of installation software such as the developing and hosting website	3200	Fixed Cost
Other expenses	Contingency fee added in case of emergencies	2666	Indirect cost

Feasibility

Feasibility Rating	Assessment Method
4	Budget: This solution is the most cost effective however it is time consuming for the developers to maintain the system after the project.
3	Scope: The solution meets the requirements to solve the problem however it is not the most innovative or engaging solution
4	Schedule: The project will be completed in the given timeframe. However the website will have to be updated regularly

Risks

Risk Description	Risk Likelihood	Risk Impact	Risk Mitigating Actions
Budget	Medium	High	Plan the budget ahead of time to ensure scope-creep

			does not put the project at risk
Schedule	Low	High	Project management techniques such as a PERT chart should be strictly followed
Maintenance	High	Low	Ensure website is check regularly for any added functionality requested by end users

Issues

Issue Description	Issue Priority	Action Required to Resolve Issue
Long-term commitment to Website Host Service	Medium	Create your own hosting platform but this could increase cost exponentially. Ensure the host is reliable.
Internet Connection	High	Provide some offline functionality such as the ability to download a module and do it offline
Data privacy	High	Since the website requires the user to give some form of identification data, privacy is important. Especially since the data comes from minors. Have to ensure that data protection regulations and strict access controls are implemented on website
Competency of users	Medium	Provide a user guide or tutorial on how to navigate the website and complete lessons

Solution 3: Robotic Kits

Description

This solution focuses on constructing a robotics kit with different components which children can manipulate to build a robot of their liking. This solution focuses on hands-on learning and teaches children coding, electronics and engineering skills. Each component has to be handled with care since each kit aims to only have one available component type to lower costs. Therefore safety and care should be taught to children before they use components.

Benefits

Benefit Category	Benefit Description	Benefit Value

Business problem	The main problem identified is the lack of digital education tools. This solution provides an interactive interface through gaming to support retention and interest.	5
Opportunity	This solution will create interest in digital fields which in turn will generate more interest to Universities providing degrees in STEM fields	5
Engagement	The solution focuses on the gamification of education which is of great interest to children. Since the approach focused on hand-on learning children are forced in a sense to be consistently engaged	5
Accessibility	The kit will be a bit expensive due to component cost. However once the kit is received children will have access to all resources and components to build what they desire.	2
Technological Execution	The kit uses different electronic components, however if children want to code their robot to do certain actions they require a computer.	3

Costs

Expense Category	Expense Description	Expense Value	Expense Type
Cost of human resources	The cost involved paying developers and project managers to develop the system	570000	Indirect cost
Operational Cost	The cost involved traveling to stakeholders and end-users including accommodation	20865	Direct cost
Equipment	The cost of buying different robotic components	25772	Fixed Cost

Other expenses	Contingency fee added in case of emergencies	6167	Indirect cost

Feasibility

Feasibility Rating	Assessment Method
2	Budget: The project has the potential to go over budget. Components are expensive to replace therefor contingency fees are also higher
4	Scope: The solutions fix into the scope and provide a hand-on approach which is seen to enhance engagement and retention. However similar solutions have been done in the past therefore it does not show as much innovation.
5	Schedule: The project will be completed in the timeframe

Risks

Risk Description	Risk Likelihood	Risk Impact	Risk Mitigating Actions
Budget	High	High	Project manager and developers has to have strict budget restrictions and they have to ensure that component breakage does not put the project at risk
Maintenance Cost	High	Medium	Ensure components are as durable as possible by using good quality materials
Implementation Issues	Medium	High	Ensure user guide and troubleshooting of components are well defined and explained.

Issues

Issue Description	Issue Priority	Action Required to Resolve Issue
Technical competence	High	Ensure both teachers and students understand the risk associated with working with electronic components. This can be done through training.

5. Feasibility Ranking

5.1 Ranking Criteria

The following is an explanation on how the ranking criteria was set up. A solution is given a score out of 5 for each criteria. The score is then multiplied by a weight which represents the relevance of the criteria in the scope of the project. The project with the highest score is seen as the project with the best feasibility. The following criteria was used to rank the possible solutions.

1. User Engagement:

   This refers to how effectively the solutions can capture and retain the users attention. A solution with a high score means the user is engaged with the system. This makes them more likely to continue using the provided solution. A solution with a low score indicates that retention and engagement in the solution could be improved and at the moment is low.

2. Maintainability:

   This refers to how easy it would be for the solution to be updated after it has been given to the end users. A maintainable solution will make long-term upkeep easy to do. An unmaintainable solution on the other hand makes it more difficult to grow the product.

3. Affordability:

   This refers to whether a solution can be kept within the available budget. Solutions must be developed, implemented and maintained within the project budget. The costs that affect the budget include hardware and software. Solutions with a high score shows that they are able to keep within budget while those with a low score struggle.

4. Technical Feasibility:

   This refers to the current technical resources and the availability of required technology used to build and deploy the solution. A solution with a high score means the technology is easily attainable and available. A solution with a low score indicates technical difficulties.

5. Accessibility:

   This refers to how easy it is for users to access these solutions. Solutions with a high score indicate easy access to the product. Solutions with a low score indicate difficulty of finding or using a product.

5.2 Ranking Scores

	Solution 1			Solution 2			Solution 3		
Criteria	Score	Weight	Total	Score	Weight	Total	Score	Weight	Total
User Engagement	5	30%	**1,5**	3	30%	**0,9**	5	30%	1
Maintainability	3	10%	**0,3**	4	10%	**0,4**	3	10%	0,3
Affordability	4	25%	**1**	5	25%	**1**	2	25%	0,5
Technical Feasibility	4	10%	**0,4**	3	10%	**0,3**	3	10%	0,3
Accessibility	4	25%	**1**	2	25%	**0,5**	2	25%	0,5
Total Score	20		**4,2**	17		**3,1**	15		**2,6**

6. Feasibility Result

Solution 1: The Portable Arcade Box gets the greatest overall score indicating that it is the best option for satisfying most of the requirements. This method focuses on interactive learning through gaming which is extremely beneficial for engaging users, particularly with younger kids. The arcade box piques the interest of young learners while also instilling a passion for coding and problem solving.

The incorporation of common gaming features allows students to investigate coding principles in a fun setting, allowing them to investigate coding principles in a fun setting, allowing them to experiment and learn at their own speed. Furthermore, the utilization of technologies such as the Raspberry Pi 4 and Arduino kit strengthens the project's foundations, allowing for real-time feedback and interactive elements that keep people interested.

Furthermore, the emphasis on collaborative play encourages social contact among peers. Which enhances the learning experience? The Portable Arcade Box is anticipated to foster a more inclusive educational environment by catering to a variety of learning styles and interests. Overall, this solution stands out as a complete method to teaching coding skills while also inspiring creative and critical thinking in young learners, making it an excellent choice for educational projects

7.Appendix

Google Form

https://docs.google.com/forms/d/e/1FAIpQLSfcXE-hk2rk4YuoaaP_O0FBnMxppq-6ZJcYOS-DoT8P5KP-Ug/viewform?usp=pp_url

This Google Form is intended to collect input from instructors on the Portable Arcade Box project. The form's objective is to gather information about the possible implementation of coding education for young learners, identify challenges to teaching coding, and determine instructors' preferences for educational resources. Your feedback will help influence the creation of interesting and effective materials to improve digital literacy in the classroom.

Excel Spreadsheet

https://docs.google.com/spreadsheets/d/1QIlxnidbgZEE17phpzNKejXvE5yeJAj-/edit?usp=sharing&ouid=117179810862297933975&rtpof=true&sd=true

This Excel Spreadsheet gives an explanation on how the cost for the different solutions were calculated and defined.

8.References

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